

being obliterated; in fact, there was the most intense œdema of all the loose laryngeal tissues above the true cords. Below the latter there was no evidence of œdema. The tissue at either side of the arytenoepiglottidean folds was also markedly œdematous. It is an interesting fact that no trace of scar from the tracheotomy wounds can be found in the trachea. The accompanying photographs, taken from the fresh specimen by Dr. C. H. Baker, illustrate beautifully the condition found.

In concluding this brief note I wish to express my thanks to Dr. Dock for his kindness in placing the specimen, which was sent to him, at my disposal for this report; while my indebtedness to Dr. Baker, and especially to Dr. Randall, is obvious.

EXAMINATION OF THE BLOOD IN PULMONARY TUBERCULOSIS, WITH SPECIAL REFERENCE TO PROGNOSIS.

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HISTORICAL.—The blood in tuberculosis has for many years been the subject of investigation by many different observers. Among the first series of clinical examinations of the blood we find cases of tuberculosis recorded, as these earlier reports were based upon methods of examination so different from those now in use and the details of the condition of the patient are so commonly omitted they are of very little service for comparison with the more recent examinations.

In tuberculosis we have such a chronic condition, one which presents so many different phases, types and complications, and which may affect so many organs, that it is not to be wondered at that the results of blood examinations by different observers vary so widely. It is, therefore, only by taking the statistics, classifying the findings in different types of tuberculosis, and studying them in relation to one another that we can hope to derive any information of value for diagnosis and prognosis.

HÆMOGLOBIN. As this was the first component of the blood to be studied quantitatively for clinical purposes we find a large

series of estimations of this element. The methods varied greatly from the spectroscopic to the purely chemical, which renders the results hard to correlate. That the hæmoglobin is constantly reduced in bone tuberculosis has been shown by Vierordt, Lacker, Bierfreund, and Dane. That, on the other hand, this reduction is not constant in pulmonary tuberculosis of various grades is shown by Leichtenstern, Gnezda, Barbacci, and Oppenheimer, who found fairly numerous cases in which the hæmoglobin was above normal. Quinquaud, Wiskeman, Laache, Neubert, Reinert, v. Noorden, Biernacki, Strauss, and Rohnstein, and Stevens found a decrease in hæmoglobin of varying degree in all cases. In those instances in which the cases have been grouped according to Grawitz's system we find the hæmoglobin is given as follows: Group I.: v. Limbeck, Ewing, and Swan, decreased; Appelbaum, decreased or normal; Cabot, increased or normal. Group II.: Cabot and Swan, reduced; v. Limbeck, Appelbaum, and Ewing, normal or approximately so. Group III.: All the writers found it reduced. The majority, therefore, found it reduced in Group I., normal in Group II., and reduced again in Group III. The amount of reduction varied greatly in the different reports. In regard to the high hæmoglobin finding in Group II. we will refer again in considering the red corpuscles.

ERYTHROCYTES. Andral, Sörenson, Pick, v. Noorden, Zappert, Biernacki, Strauss and Rohnstein, and Claude and Zaky found a constant reduction of the red corpuscles in tuberculosis of various stages. Becquerel, Melassez, Laache, Neubert, Reinert, Cabot, and Da Costa found the decrease was not constant, as in some of the cases the count was normal or above normal. The most marked decrease was in a case reported by Melassez, in which the red cells were as low as 980,000. Oppenheimer believes the count is normal in this condition and only reduced by hæmoptysis. Dane, in bone tuberculosis in children, found the reds, as a rule, not reduced. Where the cases are classified we find the following: Group I.: v. Limbeck, Strauer, Grawitz, Halbron, and Swan give a reduction in the red cells; Stevens, Appelbaum, and Ewing believe they are reduced frequently, but may be normal. Group II.: All the observers give a normal or increased count except Swan and Halbron, the former, however, finding it sometimes increased; Halbron found it constantly decreased. In Group III., all the above investigators found the red cells reduced except Swan, who found them generally much reduced, but increased in 3 out of 15 cases. The evidence in regard to the red corpuscles points to the fact that in cases of infiltration or cavity formation with hectic fever, especially the latter, they are decreased in number. That in cases with cavity formation without fever or complications, and occasionally also in the other two groups, we have a normal or even increased count. This peculiar and striking condition was explained by the earlier

writers by concentration of the blood, and this has been confirmed by later research.

Different observers have given profuse expectoration, sweating, and diarrhœa as causes for the production of this concentration. They commonly, however, found cases in which none of the above causes were present. The experiments of Gärtner and Römer have shed new light on the subject and their deductions have been generally accepted. They show that the extracts of the tubercle bacillus produced an alteration in the relations between the blood-vessels and the tissues in the interchange of lymph, with an excess in favor of the tissues. The findings of Oliver may also have some bearing upon this phenomenon.

The most striking feature that we find in all the reports, in connection with the erythrocytes, is the almost constant disproportion between the red cells and the hæmoglobin. All the observers mentioned above found a greater diminution of the hæmoglobin except Oppenheimer and Biernacki, and in addition to those mentioned Hayem, Huard, Cornil, Hanot, Trousseau, Gilbert, and Labbé have specially referred to this very constant finding. Sörenson was the first to point out the striking similarity of the blood in tuberculosis and chlorosis and Labbé has recently considered the subject in detail.

In regard to the prognosis based on the blood findings one must be very cautious, as numerous observers have found the erythrocytes and hæmoglobin increase in cases which were developing general tuberculosis and advancing toward a fatal termination.

The literature is very meagre upon the microscopic changes in the red corpuscles. Anisocytosis, poikilocytosis, and nucleated reds are rarely found, the last being very infrequent even after hemorrhage. Maragliano believes the presence of polychromatophilia has an unfavorable prognostic significance even in cases otherwise apparently favorable.

LEUKOCYTES. The results in numerous observations upon the number of leukocytes are quite uniform, although the line between different groups is not sharply drawn. The earlier observers, Sörenson, Halla, and Reinert found the white cells were generally increased, and in advanced cases were occasionally low. Pick, Rieder, Warthin, v. Jaksch, Galbraith, and numerous others have found the counts in pure tuberculosis without complications were always normal or even low. Among those who have classified their cases we find that Strauer, Appelbaum, Grawitz, and Halbron all found an absence of leukocytosis in Group I. The leukocytosis increases in Groups II. and III., depending upon the degree of mixed infection. The significance of leukocytosis in tuberculosis is best summed up in Ewing's conclusion that "In pulmonary tuberculosis an increase of leukocytes is usually referable to suppurating cavities, advancing pneumonia, severe anæmia, or hæmoptysis."

Varieties of Leukocytes. As the actual number of leukocytes has proven of so little value from a diagnostic standpoint, especially in early cases, an attempt has been made to derive some information from the relative number of the different varieties of cells. We are here confronted with a great many reports differing greatly, not only on account of different groupings of the cases, but also on account of different classifications of the leukocytes. Einhorn and Neubert both found the polymorphonuclears in excess in various stages. The consensus of opinion among the more recent observers is that where we have leukocytosis in tuberculous cases we have a relative increase of the polymorphonuclears. Appelbaum noted an increase of the transitionals accompanying the rise of polymorphonuclears. Ewing and Halbron found in acute and most chronic tuberculosis the large mononuclears in excess. Galbraith found an increase of large mononuclears under rich proteid diet, and Strauss and Rohnstein received the impression that with the progress of the disease the mononuclears showed a tendency to fall.

As the eosinophiles have attracted special attention in tuberculosis we have decided to consider them separately. Cabot does not consider their presence or absence of much significance. All the other observers consider them of some prognostic importance. Zappert found them decreased in febrile cases with an increase subsequent to, or occasionally before, the disappearance of fever. That they were absent or only few in number in severe cases was noted by Holmes, Warthin, Appelbaum, and Swan. On the other hand, that they were present in early cases or reappeared under treatment has been remarked by Claude and Zaky, Appelbaum, and Galbraith. Halbron thought they indicated the resistance of the organism to the infection. Teichmüller considered their appearance in the sputum in large numbers to be a favorable sign.

Experimental tuberculosis, to which one would naturally look for confirmation of the clinical finding, has unfortunately not proven as constant and satisfactory as one could wish. Achard and Loeper found a relative increase of the mononuclears in acute tuberculosis and in those cases associated with serous effusion. They found in animals inoculated with tubercle bacilli a primary leukocytosis which subsided in a few days, being followed by an increase in the mononuclears, the eosinophiles reappearing more slowly. Claude and Zaky found the eosinophiles appeared in the beginning of the infection and disappeared rapidly in acutely advancing forms, but remained for a long time in the circumscribed fibrous types. They noted especially the presence of transitionals and large mononuclears in those cases which supported the infection well.

The injection of tuberculin for diagnostic purposes corresponds in its blood changes to the results of experimental tuberculosis. All the observers, Bischoff, Rieder, Botkin, and Rille, found a transient leukocytosis which was followed by an increase of the

eosinophiles even as high as 10 per cent., as reported by Bischoff. This observer also noted an increase of mononuclears and transitionals directly after the injection.

The morphological changes in the nuclei and protoplasm of the leukocytes have been studied by Holmes and by Arneth. They have both attempted to derive information from the degenerative changes in the white cells upon which to base not only the prognosis but also the diagnosis of tuberculosis. Neusser found his perinuclear granules (artefacts) in cases which tended to improve.

The following is a report of observations on the blood in 39 cases of pulmonary tuberculosis, in the wards of the Henry Phipps Institute, by the writers, who were assisted in the early part of the work by Dr. Nisbet, of Philadelphia.

In tabulating our cases we have used the Grawitz system, which divides the cases into three groups. Group I.: Infiltration, with no signs of cavity. Group II.: Those having cavity formation, with little or no fever (the original classification also states "and no complications" in this group; as we had only one case of laryngitis, No. 2056, and three with slight intestinal symptoms, Nos. 2056, 2388, and 2919, we have included them in this group). Group III.: Cases with cavity formation and a hectic type of temperature. We have further subdivided each group into "favorable cases," "stationary cases" and "fatal cases," under the last heading including two cases which were rather rapidly declining. The stationary cases are also unfavorable, as they have not improved under favorable circumstances.

HÆMOGLOBIN. ORIGINAL COUNTS.

	I.	II.	III.	I.	II.	III.
40-45	0	1	0	.....	2388	
45-50	0	0	0			
50-55	0	0	1	.....	.....	2843
55-60	0	0	4	.....	.....	2660, 106, 2087, 2672
60-65	0	1	1	.....	2957	73
65-70	1	3	1	2827	3101, 2923, 3060	2737
70-75	3	3	0	2683, 2799, 1694	2056, 3005, 2826	
75-80	1	3	2	951	2760, 1975, 2919	2478, 2879
80-85	3	1	0	1950, 2984, 2758	2266	
85-90	0	3	1	.....	3015, 2674, 2676	1554
90-95	0	3	2	.....	2632, 3065, 2764	388, 3054
95-100	0	0	1	.....	.....	3079
I. Maximum	84	1950		Minimum	66	2827
II. "	90	3065, 2764, 2632		"	40	2388
III. "	100	3079		"	50	2843
						Average = 74.8
						" = 75.6
						" = 70.6

The hæmoglobin in Group I. is quite constantly moderately reduced, averaging 74.8 per cent. In Group II. we find a very slight increase in the amount of hæmoglobin, in the general average, to 75.6 per cent.; in this group, however, we find a great variation in the amount, just as we do in Group III. In the latter we find a decrease in the average to 70.6 per cent., which would be more marked if it were not for three fatal cases which had a very high hæmoglobin percentage. It will be noted that the difference in hæmoglobin in the three groups follows very closely the changes in the red corpuscles.

ERYTHROCYTES. ORIGINAL COUNTS IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
2,500,000-3,000,000	0	0	1	.....	.....	73
3,000,000-3,500,000	0	1	2	.....	3101	2660, 2843
3,500,000-4,000,000	1	0	5	951	.....	2478, 106, 2087, 2879, 2672
4,000,000-4,500,000	3	4	0	2683, 1950, 2827	3005, 2056, 3060, 2676	
4,500,000-5,000,000	4	9	0	2984, 2758, 2799, 1694	2826, 3015, 2023, 2266, 2632, 1975, 2674, 3065, 2388	
5,000,000-5,500,000	0	3	3	.....	2919, 2957, 2764	1554, 3054, 2737
5,500,000-6,000,000	0	1	2	.....	2760	3079, 388
I. Maximum	4,930,000	2758	Minimum	3,920,000	951	Average = 4,510,000
II. "	5,550,000	2760	"	3,250,000	3101	" = 4,630,000
III. "	5,870,000	3079	"	2,950,000	73	" = 4,297,000

HÆMOGLOBIN OR COLOR INDEX. ORIGINAL COUNTS.

	I.	II.	III.	I.	II.	III.
0.30 to 0.40	0	0	0			
0.40 " 0.50	0	1	0	.....	2388	
0.50 " 0.60	0	0	0			
0.60 " 0.70	0	1	1	.....	2957	2737
0.70 " 0.80	4	6	3	2683, 2827, 2799, 1694	1975, 2760, 2826, 2923, 3060, 2919	2843, 2087, 2672
0.80 " 0.90	2	3	6	2984, 2758	3005, 2056, 2266	2660, 1554, 106, 388, 3054, 3079
0.90 " 1.00	2	5	2	951, 1950	2632, 3015, 2674, 3065, 2764	2478, 2879
Over 1.00	0	2	1	.....	3101, 2676	73
I. Maximum	0.95	951	Minimum	0.73	2799	Average = 0.826
II. "	1.05	2676	"	0.42	2388	" = 0.823
III. "	1.01	73	"	0.60	2737	" = 0.831

In considering the number of erythrocytes we find that in Group I. the 8 cases ranged between 3,920,000 and 4,930,000 with an average of 4,510,000. The 18 cases in Group II. varied between 3,250,000 and 5,550,000, averaging 4,630,000. In Group III. 13 cases gave from 2,950,000 to 5,870,000, average 4,297,000. We find, therefore, in Group I. a mild anæmia, in Group II. the average is higher, and that in Group III. we have two distinct divisions of cases, those with a distinctly low count mainly made up of "stationary cases," and a group in which the counts are quite high, almost entirely made up of "fatal cases." The average for this group is lower than either of the preceding groups. In only one instance, Case 1694, was a single normoblast noted.

The study of the color index or the relation of the red corpuscles to the hæmoglobin gives very striking figures. In all three groups the color index averages practically the same and this average is distinctly below normal. In Group I. none of the cases reach normal, ranging between 0.73 and 0.95, averaging 0.826. In Groups II. and III. we have a much wider range in the figures, 3 cases going above 1 and 3 falling below 0.70; the average for Groups II. and III. being 0.823 and 0.831 respectively.

LEUKOCYTES. ACTUAL COUNTS.

	I.	II.	III.	I.	II.	III.
6,000 to 7,000	2	0	0	951, 2799		
7,000 " 8,000	1	1	0	1950	3060	
8,000 " 9,000	1	2	2	1694	2632, 2919	2672, 388
9,000 " 10,000	0	3	0	.....	2266, 2388, 2957	
10,000 " 11,000	1	1	3	2984	2676	1554, 3054, 2879
11,000 " 12,000	0	2	0	.....	2760, 1975	
12,000 " 15,000	2	3	2	2758, 2827	3015, 2923, 2674	2478, 3079
15,000 " 20,000	1	6	5	2683	3005, 3101, 2826, 2056, 3065, 2764	106, 2843, 2087, 2737, 73
Over 20,000	0	0	1	.....	.....	2660 (empyema)
I. Maximum	16,440	2683		Minimum	6,100 2799	Average = 10,285
II. "	19,200	2056, 2764		"	7,600 3060	" = 12,772
III. "	20,640	2660		"	8,800 388	" = 14,041

The leukocytes show marked variation in all the groups, the average, however, increasing gradually from Group I. to Group III. We found no typical condition for any one group.

The differential count of the leukocytes in the stained specimen gives information which one would expect to be of value in regard to the diagnosis of this condition. The findings in the present series of cases are rather contradictory and confusing. We found that the actual number of each variety was more significant than

the relative percentage and we have therefore used it in all our considerations.

LYMPHOCYTES. ACTUAL NUMBER IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
300 to 600	1	5	5	2799	3060, 1975, 2760 2923, 2764	2879, 1554, 2672 3054, 3079
600 " 900	0	4	0	.....	3101, 2826, 2919, 2957	
900 " 1200	1	4	4	2758	3015, 2266, 3065, 2676	2478, 2660, 2843, 388
1200 " 1500	3	2	0	2683, 1694, 2827	2632, 2388	
1500 " 1800	2	2	1	951, 1950	3005, 2056	2737
1800 " 2100	0	0	0			
2100 " 2400	1	0	0	2984		
2400 " 2700	0	1	1	.....	2674	2087
2700 " 3000	0	0	1	.....	.....	73
Over 3000	0	0	1	.....	.....	106
Below 1200	25%	72.5%	70%			
1200 to 2400	75	22.0	7			
Over 2400	0	5.5	23			

LYMPHOCYTES. We found in Group I. the lymphocytes were either normal (75 per cent. of cases) or subnormal. In Group II. the majority of cases (72 per cent.) showed a count below normal, as they did also in Group III. (70 per cent.). In Group II. they were increased in 5 per cent., and in Group III. in 23 per cent. of the cases. We have not been able to correlate these rather contradictory findings, except that the majority of the fatal cases were among those showing a lower count.

EOSINOPHILES, POLYMORPHONUCLEARS. ACTUAL NUMBER IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
Below 100	1	9	6	951	3005, 2632, 2266, 3101, 2760, 3015, 2919, 2388, 2676	2478, 1554, 2843, 2672, 2879, 73
100 to 200	1	6	2	1694	3060, 2826, 2674, 3065, 2957, 2764	3054, 3079
200 " 300	3	0	2	2984, 2827, 2799	.....	2737, 388
300 " 400	2	1	3	2683, 1950	1975	2660, 106, 2087
400 " 500	0	0	0			
Over 500	1	2	0	2758	2923, 2056	
Below 100	12.5%	50%	46%			
100 to 400	75.0	39	54			
Above 400	12.5	11	0			

POLYMORPHONUCLEAR NEUTROPHILES IN THIRTY-NINE CASES.
ACTUAL NUMBERS.

	I.	II.	III.	I.	II.	III.
3,000 to 6,000	5	4	1	951, 1950, 2799, 2984, 1694	2957, 2632, 3060, 2266	388
6,000 " 9,000	1	5	4	2758	2388, 2919, 2676, 2760, 1975	2672, 2879, 3054, 1554
9,000 " 12,000	2	3	4	2827, 2683	3015, 2923, 2674	2737, 3079, 2478, 106
12,000 " 15,000	0	5	3	.....	3101, 3005, 2826, 2056, 3065	73, 2843, 2087
15,000 " 18,000	0	1	1	.....	2764	2660
Below 6,000	62.50%	22.22%	7.69%			
6,000 to 12,000	37.50	44.44	61.53			
12,000 " 18,000	0	33.33	30.76			

TRANSITIONALS. ACTUAL NUMBER IN THIRTY-NINE CASES.

	I.	II.	III.	I.	II.	III.
Below 300	1	0	0	1950		
300 to 600	2	1	0	951, 2758	2266	
600 " 900	1	5	5	2799	2923, 1975, 3060, 2919, 2388	73, 2672, 2879, 3079, 1554
900 " 1200	3	5	2	2683, 2827, 1694	2826, 2632, 3015, 2764, 2957	106, 2087
1200 " 1500	0	6	2	.....	3101, 2760, 3005, 3065, 2674, 2676	3054, 388
1500 " 2100	1	1	3	2984	2056	2478, 2737, 2660
Over 2100	0	0	1	.....	.....	2843
Below 300	12.5%	0	0			
300 to 1200	75.0	61%	54%			
Over 1200	12.5	39	46			

LARGE MONONUCLEARS. THIRTY-NINE CASES. ACTUAL NUMBERS.

	I.	II.	III.	I.	II.	III.
Below 300	3	7	2	951, 2984, 1694	2760, 3005, 2632 2674, 3065, 2919, 2676	2672, 388
300 to 600	1	1	9	2799	3015	2478, 2660, 2087, 106, 2879, 73, 2737, 3054, 3079
600 " 900	1	3	1	2827	2923, 3060, 2388	1554
900 " 1200	1	4	1	1950	3101, 2826, 2266, 2764	2843
1200 " 1500	0	1	0	.....	1975	
1500 " 1800	1	2	0	2758	2056, 2957	
1800 " 2100	1	0	0	2683		
Below 300	37.5%	38.5%	15.5%			
300 to 600	12.5	5.5	69.0			
600 " 1200	25.0	38.5	15.5			
Over 1200	25.0	17.5	0			

EOSINOPHILE POLYMORPHONUCLEARS. Here our findings were more definite. In Group I. we found 87.5 per cent. of all cases were normal or above normal. In Group II., 50 per cent. of cases were below normal, while in Group III. the eosinophiles were never above normal. In only 3 cases of all three groups were they found above 500, and they were all favorable.

The estimation of the polymorphonuclears, transitionals, and large mononuclears showed nothing of special significance.

In 2 cases, Nos. 2683 and 73, in which there was a leukocytosis of 16,000, there was a single myelocyte noted.

In 25 of the above cases it was possible to make a second count while the patient was still in the hospital. The second counts were made after an interval of two to two and one-half months. The duplicate counts being made to see if there were any changes in the blood upon which one could base the prognosis. Of these cases 4 were in Group I., 16 in Group II., and 5 in Group III.

Cases remaining under observation. Increase and decrease referring to second count in comparison to first count. Counts made about two to three months apart.

ERYTHROCYTES.

	Increased.	Decrease.	Increase.	Decrease.
I.	951, 2683, 1950	1694	75 %	25 %
II.	3101, 3005, 2826, 2056, 3015, 2923, 2632, 3060, 1975, 2266, 3065, 2919, 2674, 2676, 2764	2760	94	6
III.	2660, 106, 1554, 2843	2737	80	20

The erythrocytes generally increase under treatment; this is true of the favorable and unfavorable alike, the increase occurring in those which are not improving as well as in those which are apparently doing very well. In the first group, however, it was noted that the one case which decreased was the only stationary one in that group and in the third group the only one to decrease was the most unfavorable one in that class. In Group II., however, they almost all increased regardless of the patient's general condition.

HÆMOGLOBIN.

	Increased.	No change.	Decreased.	Increase.	No change.	Decrease.
I.	.....	1694	951, 2683, 1950	0	25 %	75 %
II.	.....	1975, 3005, 2923, 3101, 2919	2760, 2826, 2056, 3015, 2632, 3060, 2266, 2674, 3065, 2676, 2764	0	31	69
III.	2737	2660, 2843, 106	1554	20 %	60	20

The hæmoglobin, as a rule, either remained stationary or decreased regardless of any improvement on the part of the patient. The only case in which the hæmoglobin increased was the most unfavorable one in Group III.

HÆMOGLOBIN INDEX.

	Increased.	No change.	Decreased.	Increase.	No change.	Decrease.
I.	1694	.....	951, 2683, 1950	25 %	0	75 %
II.	.....	.....	3101, 2760, 3005, 2826, 2056, 3015, 2923, 2632, 3060, 1975, 2266, 2674, 3065, 2919, 2676, 2764	0	0	100
III.	.....	2737	2660, 1554, 106, 2843	0	20 %	80

As one would naturally expect in a condition where the red cells increased in number without a corresponding increase in hæmoglobin we found an almost constant decrease in the color index.

LEUKOCYTES.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	0
II.	3101, 3015, 2923, 2632, 3060, 1975, 2266, 2919	2760, 3005, 2826, 2056, 3065, 2674, 2676, 2764	50	50 %
III.	.....	2660, 1554, 106, 2843, 2737	0	100

The leukocytes present a rather peculiar condition and one which is contrary to the usual findings. In Group I. every case showed an increase of the leukocytes under treatment. One-half the cases in Group II. present an increased count and one-half a decrease, in the latter being the majority of the unfavorable cases, and only one stationary case being found in the first half. In Group III. in every case the leukocytes were found to have decreased.

LYMPHOCYTES COMPARATIVE COUNTS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	0
II.	3101, 2826, 2056, 2923, 3060, 1975, 2266, 2674, 3065, 2764	2760, 3005, 3015, 2632, 2919, 2676	62.5	37.5 %
III.	2660, 2843	106, 1554, 2737	40	60

LYMPHOCYTES. We feel that in the actual number of this form of leukocyte we have perhaps one of the best indications upon which to base the prognosis, although it is not absolute. In Group I. we found an increase of 100 per cent., in Group II. only 62.5

per cent. increased, while in Group III. we find only 40 per cent. showed an increase in the number of lymphocytes.

EOSINOPHILE POLYMORPHONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 1950, 1694	2683	75 %	25 %
II.	3005, 3015, 2923, 2632, 3060, 2674, 2919, 2764	3101, 2760, 2826, 2056, 1975, 2266, 3065, 2676	50	50
III.	1554	2660, 2843, 106, 2737	20	80

EOSINOPHILES. This variety, in a general way, followed the same course as the foregoing. In Group I. 75 per cent. increased; in Group II., 50 per cent. and in Group III., 20 per cent. of the patients showed an increase of the eosinophiles, the one case being a stationary one.

NEUTROPHILE POLYMORPHONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694	.....	100 %	
II.	3101, 3015, 2923, 2632, 3060, 1975, 2266, 2919, 2676 ¹	2760, 3005, 2826, 2056, 2674, 3065, 2764	56	44 %
III.	2843 ¹	2660, 106, 1554, 2737	20	80

NEUTROPHILE POLYMORPHONUCLEARS. These follow exactly the increase or decrease in the number of leukocytes except in Cases 2843 and 2676, and in the latter one of these the increase in this variety was less than 100.

LARGE MONONUCLEARS.

	Increased.	Decreased.	Increase.	Decrease.
I.	.....	951, 2683, 1950, 1694	0	100 %
II.	3101, 2760, 3005, 3015, 2923, 2632, 1975, 2266, 3065, 2919, 2676, 2764	2826, 2056, 3060, 2674	75 %	25
III.	1554	2660, 106, 2843, 2737	20	80

LARGE MONONUCLEARS. This variety decreased in all of the first group. In Group II., in 75 per cent. of the patients, they increased regardless of the character of the case, and in Group III. 1 case out of the 5, which was a stationary case, showed an increase.

¹ Only cases in which the polys. did not correspond to increase or decrease of lenkocytes, q. v.

TRANSITIONAL FORMS.

	Increased.	Decreased.	Increase.	Decrease.
I.	951, 2683, 1950, 1694,	.....	100 %	0
II.	2023, 3060, 1975	3101, 2760, 3005, 2826, 2056, 3015, 2632, 2266, 2674, 3065, 2919, 2676, 2764	19	81 %
III.	.....	2843, 106, 2660, 1554, 2737	0	100

TRANSITIONALS. These showed a very interesting change. In Group I. they were increased in every case, while in Group III. every case showed a decrease. Group II. showed a decrease in 81 per cent. of cases. All those in this group that showed an increase of this form were improving cases.

From these examinations we would draw the following conclusions, being fully convinced, however, that the series is too limited in number and the field covered too narrow to draw deductions which could be considered by any means final:

1. In pulmonary tuberculosis without cavity formation a mild anæmia, with a decrease in erythrocytes and a relatively greater decrease in hæmoglobin, is constant.

2. From the standpoint of prognosis an increase of the erythrocytes, in cases without cavity formation, is of favorable significance.

3. In advanced cases a decrease of the leukocytes is of unfavorable import.

4. In our investigations we have received the impression that the actual increase of lymphocytes seems to correspond to the increase of resistance on the part of the organism to the tuberculous infection, but further study is required to confirm this deduction.

5. The transitionals seem to follow the same rule as the lymphocytes in this regard.

6. At the beginning of the investigation the eosinophiles seemed to increase with the patient's improvement, but further study did not support this view.

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